

Servicewide Water Quality Monitoring **CORE PARAMETERS**



2 Workgroups Organized

- **Fresh Water Workgroup** (WRD FOCO office Mar. 2002)
 - Rosenlieb & Penoyer (Co-chair WRD)
 - 18 Participants (State, Federal, Academia., Parks, WRD)
 - Federal NAWQA & EMAP Programs
 - State TMDL Programs
 - NWQMC representatives
 - Produced “White Paper” summary of results/topics addressed
- **Marine/Estuarine Workgroup** (Naragansett, RI. Apr. 2002)
 - Irwin & Roman (Co-chair WRD & USGS)
 - 9 Participants (State, Federal, Acad., Parks, WRD)

Questions to Answer by 2 Wk Gps

- What should a core set consist of
- Should they be mandatory/required (i.e at all monitoring stations)
- Should they be the same or different for freshwater Vs marine/estuarine sites
- Is there a purpose served by such a requirement (commonality, consistency comparability of a data set Servicewide)

Consensus/Conclusions Reached

- **Freshwater & Marine/Estuarine Workgroups**

- Core set of **Required Parameters** are reasonable expectation of a long term program to meet Servicewide goals and objectives
- **Needed to ensure:**
 - Some measure of commonality, comparability and consistency of data set between networks
 - Universal data set to roll up on national scale (to some degree)
 - Network flexibility maintained with minimal cost burden
 - Consistent with Cooperative approach (i.e. Collection is widespread/universal)

4 WC Parameters Selected (FW)

● <u>Parameter</u>	<u>Units</u>
temperature	°C
specific conductance	uS/cm
pH	std. pH units
dissolved oxygen	mg/l

* These should all be field measurements collected with a probe (in-situ measurements preferred, prob. easiest with multiprobe)

Parameters Selected (con't)

- Recognition that flow is often very important if not a crucial piece of information to collect in conjunction with water column and other water quality measurements (e.g. TMDL)
- 5th Qualitative Measurement (estimate, at minimum)
 - Flow / Discharge - Flowing Water Case (e.g. stream)
 - Stage / Level - Non-flowing Water Case (e.g. lake, reservoir, wetland)

* Quantitative Flow / Level measurements are strongly recommended (e.g. at a gage station) wherever possible but are not required

Freshwater: Flow / Discharge

- A qualitative estimate/assessment of flow/discharge will be made in lieu of the preferred quantitative measurement when no staff or stream gage is available for a site
 - low, medium, high, flood stage based on estimate of % bank full, overbank condition, or using another hydrograph from nearest gage site on that stream

Stage/Level (still / non-flowing water)

- A qualitative estimate/assessment of stage/level will be reported at a minimum, in lieu of a preferred quantitative measurement or stage/level value available for waterbody from manager/responsible agency (BLM, COE, BOR, USGS)
 - Low, medium, high, in flood stage/extreme high level
- Depth/vertical profile of core water column parameters also required (consistent with most protocols)

Other Required Information

- Metadata to support STORET and NPS needs
- Photographic documentation of each monitoring site (1 digital photo at minimum*)

*** Ver. 2 of New STORET will have this photo storage capability so WRD building into Data Template**

Parameters Selected: Marine/Estuarine Work Group

- Same 4 WC Parameters As Freshwater Group (measure Sp. Cond., salinity (ppt) computed using -ISO algorithm)
- Added - Photosynthetically Active Radiation (PAR) Penetration Depth
- Recommend Using EPA: Environmental Monitoring and Assessment Program (EMAP): National Coastal Assessment Field Operations Manual For Methods
- **Metadata** — tidal stage & time related to H/L tides, direction of flow (in/flood,ebb/out), est. wave height, location & time of day

Other Topics Discussed

- Monitoring Program Drivers (CWA, GPRA, Servicewide Goals, Park Resource Mgmt. Needs) – Information System
- Metadata Requirements (STORET, NPS)
- Reporting Needs (Congress, Public, Park Mgmt.)
- Protocols and Protocol development
- Sampling – location, frequency, site rotation
- Biological Monitoring – status and NPS role
- Staffing and Training needs of Networks (inhouse)
- Analytical Lab Selection
- Sound Science and role of QA/QC
- Inclusion of other Parameters in Core set
- Improving WRD Guidance

Monitoring Drivers (2 categories)

- **Category 1 Sites**
 - **Clean Water Act* or other regulatory driven sites**
 - 303d-listing & 305b reporting
 - Watershed in TMDL Program
 - ONRW (designated or to be designated)
 - Other regulatory programs (SDWA, CERCLA, RCRA)
 - Conformance with anti-degradation policies of various agencies
- *CWA is Federal program but implemented by States
(authorized to develop narrative and numeric criteria & enforce)**

Monitoring Drivers (con't.)

- **Category 2 Sites**
 - **Other significant waterbodies having established threats or Network-identified stressors monitored for purposes of:**
 - Establishing some ecological impairment (present or future)
 - Establishing some baseline condition for future comparison
 - Assessing aquatic resource w/ another Vital Sign tie-in
 - Complying with NPS enabling legislation (maintain resources in non-impaired state)

Protocol / Protocol Development

- Network's responsibility to ID protocols used in WQ monitoring (detailed WQ monitoring work plan)
- State developed protocols have primacy when operating in any regulatory context (CWA)
- NAWQA are the default protocols (Servicewide) in lieu of applicable/prescribed State protocols
- Good protocol sources (States, USGS (NAWQA), EPA (EMAP))
- Tendency for all to become more similar w/time

Protocols con't. (Examples)

- **NAWQA** (USGS)

- <http://water.usgs.gov/owq/fieldmanual/> (Book 9; field measurements)
- <http://water.usgs.gov/nawqa/protocols/doc/list.html> (protocols)
- <http://water.usgs.gov/pubs/wri/wri004252/> (continuous monitors)

- **EMAP** (EPA)

- Marine: http://www.epa.gov/emap/nca/html/docs/c2k_qapp.pdf).

- Freshwater:

- http://www.epa.gov/emap/html/pubs/docs/groupdocs/surfwatr/field/97fop_sman.html (FW lakes)
- http://www.epa.gov/emap/html/pubs/docs/groupdocs/surfwatr/field/fomw_s.html (wade-able streams)
- http://www.epa.gov/emap/html/pubs/docs/groupdocs/surfwatr/field/Intro_mat.pdf (non-wade-able streams)

Sampling Frequency & Location

- **Depends of Questions to Be Answered and Overall Monitoring Design (See Part B guidance)**
- **Monitoring frequency**
 - **Less than monthly seldom useful** (except in specific monitoring situations - EMAP)
 - **Continuous**, best at showing short term variance (diurnal to seasonal change for sensor based/core parameter measurements (may want to establish at representative waterbody types for comparison with others in Network))

Sampling Location & Frequency

(con't.)

- Monitoring site location
 - On significant waterbody
 - Accessibility (year round)
 - Site rotation on yearly/multi-year basis (geographic clusters) makes sense to achieve greater coverage
 - Co-locate with existing stream gage or install new staff gage for flow measurement in most instances

Biologic Monitoring

- **Best to use State Protocols in States where a program has been established (work closely)**
- **Should evolve into a major element of a Network's water resource monitoring once monitoring programs, reference sites, protocols are established and gain wide acceptance**
- **NPS potentially a source of unimpaired reference sites (use as leverage)**
- **Key element of an integrated approach to aquatic resource monitoring**

Network Staffing & Training Needs

- A potentially weak link under under current funding levels, particularly for in-house programs (\$70K-110K/yr)
- Costs associated with training, equipping, and retaining water quality staff and consistently dedicating staff time (Parks) to support field efforts and maintain data quality
- Sampling team composition, safety issues, equipment, training and availability of Park staff to support Networks

Analytical Lab Selection

- Poor Lab Results (comparability) historic concern
- Contract with a NELAP accredited facility or a lab used by relevant State regulatory or monitoring program (cooperative relationship encouraged)
- Or use lab approved by USGS, Fish & Wildlife Ser., NOAA, DOD, or another Fed. agency. For approval, labs must have demonstrated adequate performance on inter-laboratory round-robin analyses of certified reference materials (See Part B for Details).
- Economics of establishing a Network lab for analytical work beyond support of field activities (instrument calibration, std. prep.) are probably not justified in most instances (labor, equipment, meeting/maintaining QA/QC stds./ requirements & other costs can be prohibitive)

Sound Science and Role of QA/QC

- QA/QC a significant component (10-20% of budget)
- Emphasis on quality of data over quantity
- Results Should be Accompanied by Quantitative Uncertainty Intervals, Using NIST Methods
- How is sound science best achieved?
 - ID good set of protocols to work from
 - Well equipped, well trained, well supported staff
 - Maintain appropriate # of QC samples
 - Do a few things well Vs a lot of things (poorly?)
 - The measurement process must be controlled for both precision and bias (= accuracy)
 - Peer Review

Inclusion of Other Parameters (in FW Core set)

- Several additional parameters considered on a case-by-case basis (turbidity, nutrients, FC etc.)
- All but flow / level rejected
 - Site/stressor specific (less universal application)
 - Cost burden (not as easily acquired, e.g. multi-probe)
 - Parameter best selected by Network based on goals, objectives, impairment concerns & questions to be answered (Part B) from P & A work
 - Expectation is that Networks would build/expand upon core set at most/all monitoring sites
- Freshwater Conclusion – add qualitative flow / level as 5th required parameter (but quantitative measurements are much more useful and desirable when feasible to collect)

Improving WRD Guidance

- Document will remain in draft form for foreseeable future
- Continually updated as new information becomes available (both technical and programmatic)
- Will initiate formal review requests to Park staff
- Part D (parameter lists/lab analytes) to be developed further through a discussion of stressor-related parameter groupings or analyte suites tied to a threat
- Desire for less voluminous document /make more concise

Key Recommendations

- CWA drivers should be looked at initially to ensure Servicewide goals are met (focus on measurable and quantifiable results – GPRA)
- ID a water resource problem and the monitoring parameter(s) that can provide some measure of impairment (long-term) and can be used to document improvements or degradation (does man's effects on a parameter vary within the range of natural fluctuations?);
temporal aspect : by event, diurnally, seasonally, long-term

WRD Technical Guidance

- **Part A - Impaired & Pristine Waters (CWA)**
- **Part B - Detailed Study Design & QA/QC**
- **Part C - Field Parameter & Protocol Considerations**
- **Part D - Lab Analytes and Monitoring (Suites)**
- **Part E - Data Reporting and Archiving**

- <http://www.nature.nps.gov/im/monitor/handbook.htm>

- <http://www1.nrintra.nps.gov/wrd/wqmtg/links.htm>

Park Vital Signs Monitoring Networks

